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(71) Applicant  
Nigel Glyn Wallace  
33 West Hill Road, Foxton, Cambridgeshire,  
CB2 6SZ, United Kingdom

(72) Inventor  
Nigel Glyn Wallace

(74) Agent and/or Address for Service  
Nigel Glyn Wallace  
33 West Hill Road, Foxton, Cambridgeshire,  
CB2 6SZ, United Kingdom

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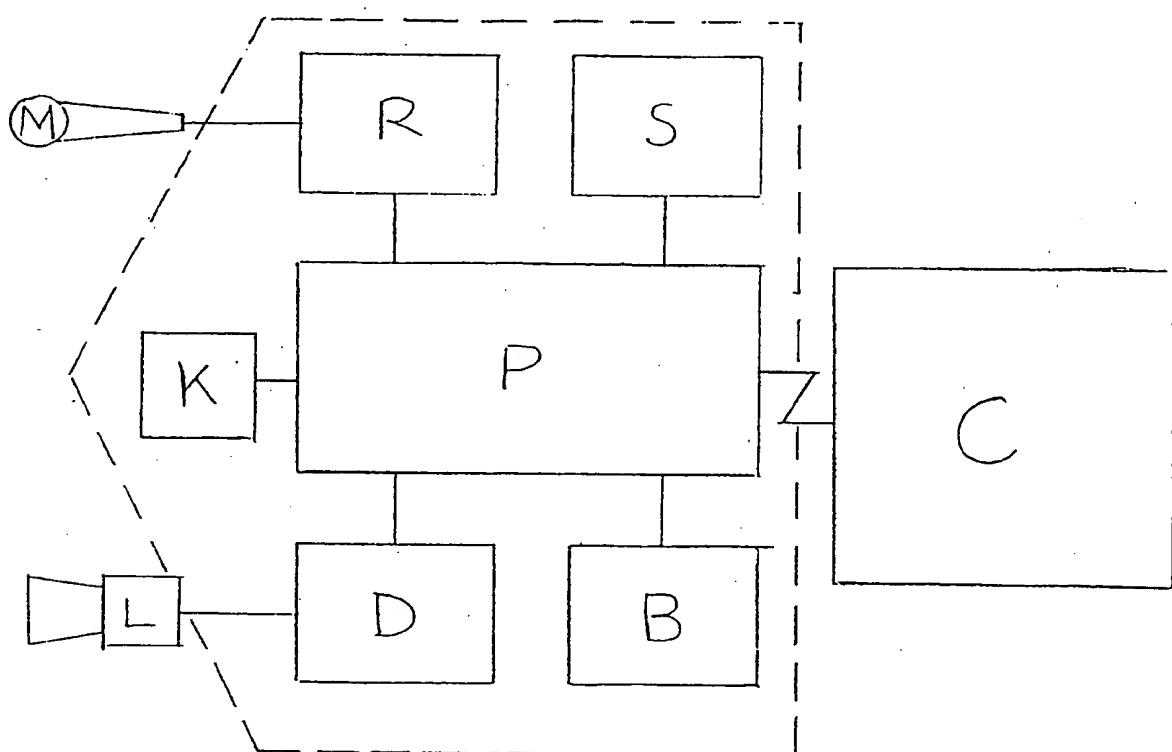
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None

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UK CL (Edition K) G4R REX RHA RHB RPC RPW  
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## (54) Speech recognition device

(57) An electronic device contained in a conveniently small box suitable for mounting on a wheelchair converts the inarticulate sounds a severely physically disabled and speed impaired person is able to make into normal intelligent conversation. It does this by allowing prerecorded words and phrases to be selected from a display screen by a code made up from a few simple sounds spoken into a microphone. The words and phrases are spoken through a loudspeaker also mounted on the wheelchair.

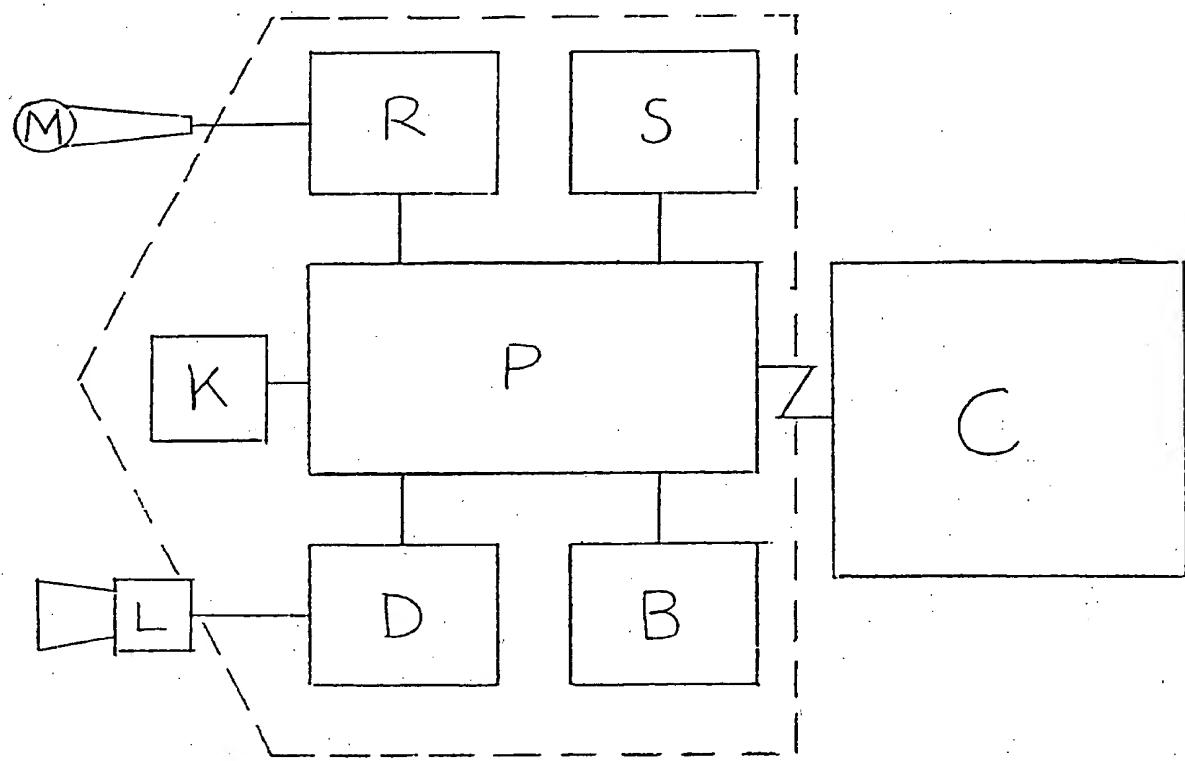
### DIAGRAM OF GRUNT CONVERTER



This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1990.

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DIAGRAM OF GRUNT CONVERTER



## PATENT SPECIFICATION

SPEECH RECOGNITION DEVICE

Device for assisting persons who can only make grunting noises to produce normal speech.

I, Nigel Glyn Wallace, a British Subject of 33 West Hill Road, Foxton, Cambridgeshire CB2 6SZ, do hereby declare the invention, for which I pray that a patent may be granted me, and the method by which it is to be performed, to be particularly described in and by the following statement : - This invention relates to a speaking device for physically disabled people of normal intelligence and hearing capability who are unable to enunciate words but may only emit a limited range of grunting sounds.

Speaking devices for such people are available by which keys or buttons are pressed to actuate speech producers, or text is entered by them from a typewriter type keyboard which is converted into synthesised speech. Many such people however are also highly spastic and severely physically disabled, such that they are unable to operate keys and buttons.

The object of this invention is to enable those who are capable of a limited range of sounds to convert them into intelligible speech.

According to this invention there is provided a combination of existing electronic devices which are controlled by a novel form of computer program instructions to enable the complete process to be performed without the aid of a normal able-bodied person or helper. A microphone is placed near to the disabled person's mouth or throat and a loudspeaker is placed at a suitable distance. The devices in between are contained in a convenient box which could be carried on a wheelchair and would be battery operated. The microphone signals are intercepted by a speech pattern recognition circuit which compares the incoming sounds with sound templates held in a Random Access Memory unit. The recognised sounds are used to select from a library of words and phrases held in the same memory unit. These coded words are turned into audio signals by a voice digitising circuit, the words and phrases having already been entered into the memory by a person capable of speech. Alternatively, a synthetic voice can be used with very much less memory requirement from a standard speech synthesiser integrated circuit.

The actions so far described are controlled by a microprocessor circuit which itself responds to grunt sounds. To enable the disabled person to monitor the operation and select the phrases required a standard liquid crystal screen is provided.

Such a device, in accordance with this invention, will now be described, by way of example only, with references to the accompanying diagram of the Grunt Converter.

The Grunt Converter is a device to convert the limited sounds available to a speech impaired person, such as a Dysarthria sufferer, into easily recognised speech. It consists of a microprocessor and memory unit (P) programmed to accept signals from a microphone (M) by way of a standard speech recogniser circuit (R), a program to store these signals in ASCII form in memory, a look-up table to find the words and phrases in the desired order displayed on a screen (S) and a standard speech digitiser (D) to transmit already recorded words and phrases to an amplifier and loudspeaker (L).

The Dysarthria sufferer/user needs to train the speech recogniser to recognise his/her grunts (this is done with a speech therapist in attendance). These sounds are described and entered on a chart on the display screen (S). Another person, male or female, selects the words and phrases most used by the disabled person and enters them into the memory of the Grunt Converter. Both these operations use the standard procedures prescribed by the makers of the units and are carried out using a standard PC computer (C). They are transferred to the Grunt Converter memory and held by battery (B) back-up permanently in the unit. The conversion programs are held on EPROM permanently and only limited controls are required to operate the unit by the Dysarthria sufferer. The phrases and words are accessed by up to 4 different grunt sounds. The user can by himself make up the phrases he or she needs from a large vocabulary of words and the phrases can be stored for future use. In cases where the user has difficulty recognising written words the graphic symbols representing words and phrases are displayed on the screen.

The Grunt Converter is contained in a small box with a window display similar to a PC portable (lap top) computer and a limited number of operating buttons (K). It is connected to a microphone (M) for grunt input and a loudspeaker (L) for speech output, and is designed to fit conveniently onto a wheelchair. It is battery operated with a mains adaptor for charging.

A further development of the Grunt Converter uses the principle of Context Selection such that screens of words and phrases are presented such that the words (or phrases) are those which naturally follow the previously selected word. By this means the number of grunts for selection is much reduced and at the same time the range of words available is greatly increased.

Another application for the Grunt Converter configuration is by way of a program for speech training. A speech therapist provides a series of spoken words of increasing difficulty which the speech impaired person tries to match. At each try the device assesses his/her accuracy and the speaking voice, pre-recorded by the therapist, encourages further attempts.

The described grunt converter device has the following advantages :-

1. Once set up it can be initiated and closed down by the disabled person without outside help.
2. It enables speech impaired persons to call up intelligible words and phrases without having to use physical movements.
3. It can be used by several such disabled persons together in a group whereby the individuals concerned can select the appropriate speaking voices for themselves.
4. If the speech recognition templates are entered by a speech therapist the device can be used to train a speech impaired person to improve his or her enunciation.

The apparatus which has been described utilises electronic semiconducting devices of the type that are normally utilised in micro-computers.

WHAT I CLAIM IS :-

1. A speech recognition device which allows speech impaired persons to select intelligible words and phrases of their choice by uttering inarticulate sounds without any physical action on their part, using already existing circuits in a novel combination controlled by microprocessor machine instructions which themselves are initiated by the disabled users of the device.
2. A speech recognition device according to claim 1 wherein the words and phrases selected are projected audibly with a pre-recorded speaking voice to the disabled person's choice.
3. A speech recognition device according to claim 1 and 2 wherein the sound activated controls allow several different speech impaired persons to talk to each other with different speaking voices.
4. A speech recognition device according to claims 1 to 3 wherein the speech recognition templates are entered by a therapist for the speech impaired person to attempt to match and thus be trained to speak correctly.
5. A speech recognition device according to claims 1 to 4 wherein means are included to automatically assess and correct the speech impaired person under training.
6. A speech recognition device substantially as hereinbefore described with reference to the accompanying diagram.

DESCRIPTION OF DRAWING

- M Microphone
- R Pattern Recognition unit
- P Microprocessor and memory unit
- S Display Screen
- D Speech Digitiser unit
- L Loudspeaker
- B Battery supply
- C Setting up computer with keyboard
- K Small keyboard for switching on by ablebodied person

Patents Act 1977  
Examiner's report to the Comptroller under  
Section 17 (The Search Report)

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Relevant Technical fields

(i) UK CI (Edition K) G4R (REX, RHA, RHB, RPC, RPW,  
RRL, RRM, RRP)  
(ii) Int CI (Edition 5) G10L

Search Examiner

J DONALDSON

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASE: WPI

Date of Search

21 AUGUST 1992

Documents considered relevant following a search in respect of claims

1 TO 6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity of document and relevant passages	Relevant to claim(s)

#### Categories of documents

**X:** Document indicating lack of novelty or of inventive step.

**Y:** Document indicating lack of inventive step if combined with one or more other documents of the same category.

**A:** Document indicating technological background and/or state of the art.

**P:** Document published on or after the declared priority date but before the filing date of the present application.

**E:** Patent document published on or after, but with priority date earlier than, the filing date of the present application.

**&:** Member of the same patent family, corresponding document.

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